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REAFFIRMED
FEB 2009

IS : 7812 - 1975

Indian Standard

CODE OF SAFETY FOR MERCURY

(First Reprint APRIL 1983)

UDC 661·849 : 614·878

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

January 1976

AMENDMENT NO. 1 DECEMBER 2006
TO
IS 7812 : 1975 CODE OF SAFETY FOR MERCURY

[*Page* 4, *clause* 3.1(j)] — Insert the following at the end:

'k) Vapour pressure 0.3 Pa at 25°C'

(*Page* 4, *clause* 3.1) — Insert the following new clause at the end:

'**3.2 Incompatibles** — Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.'

(*Page* 5, *clause* **4.1.1.3**) — Substitute the following for the existing:

'Equilibrium concentration of Hg at room temperature is 800 times the TLV for elemental and inorganic forms of mercury.'

(*Page* 6, *clause* **4.1.4**) — Substitute the following for the existing:

'The Threshold Limit Values (TLV) as recommended by ACGIH are given below:

Alkyl compounds:	TWA:	0.01 mg/m^3
	STEL:	0.03 mg/m^3
Aryl compounds:		0.1 mg/m^3
Elemental & inorganic forms:		0.025 mg/m^3'

(*Page* 8, *clause* 7.6) — Substitute the following matter for the existing:

'Mercury levels in blood and urine of employees working in areas where risk of exposure is there should be determined at suitable intervals and cases showing any deviation from the normal limits should be further investigated. In addition to pre-placement medical examination, periodic medical examination as necessary should be carried out on employees working in areas where mercury exposure is possible. Record and test of such examinations should be properly maintained.'

(CHD 8)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CODE OF SAFETY FOR MERCURY

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(*Continued on page* 2)

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(*Continued on page* 9)

Indian Standard

CODE OF SAFETY FOR MERCURY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 September 1975, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

0.2 Mercury is the only metal which is present in liquid state at ordinary temperatures. In its elemental form, it is used in a number of instruments and equipment, such as thermometers, barometers, manometers, blood pressure instruments, direct current meters, and mercury switches. Also since mercury readily forms alloys with many metals, it is used in the alkali manufacture, extraction metallurgy and in dentistry. Mercury vapour lamps and mercury arc rectifiers are some of its other important applications.

0.2.1 Mercury forms both inorganic and organic compounds. Inorganic compounds are used in various chemical reactions. Organic mercury compounds, such as fulminate, are used in explosives while alkyl mercury halides are used in seed treatment. Mercury and its compounds are toxic. A code of safety for mercury will be helpful in taking preventive measures for protection of health of persons exposed to this material in industry.

0.2.2 Metals with which mercury readily forms alloys include sodium, potassium, aluminium, copper, silver, gold and zinc. Mercury metal alloys are generally called amalgams.

0.3 This code of safety provides information on the important physical, chemical and toxic properties of the metal and recommends safety measures which should be followed while dealing with mercury.

0.3.1 This code does not cover aspects of safety with inorganic or organic mercury compounds.

0.4 In the preparation of this code, extensive assistance has been derived from the following publications:

KIRK OTHMER. Encyclopaedia of Chemical Technology. 1967. Volume 13. Interscience Publishers, New York.

GENEVA. INTERNATIONAL LABOUR OFFICE. Occupational Safety and Health Encyclopaedia. 1972.

SAX, IRVING (N). Handbook of Dangerous Materials. 1951. Reinhold Publishing Co, New York.

STRUP LESLEY BID (P). Toxicity of Mercury and Its Compounds. 1964. Elsevier Publishing Co, New York.

0.5 Legal Information — Mercury poisoning and its sequelae is included in the Schedule of Notifiable Diseases under the Factories Act, 1948. Mercury poisoning and its sequelae is a compensable disease under the Workmen's Compensation Act, 1923.

1. SCOPE

1.1 This standard describes the properties of mercury, the nature of hazards associated with it and essential information on its storage, handling, packing, labelling, disposal of waste, and personal preventive measures.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 4155-1966* and IS : 4167-1966† shall apply.

3. PROPERTIES OF MERCURY

3.1 The important properties of mercury are:

a) Atomic number	80
b) Atomic mass	200·61
c) Melting point	−38·9°C
d) Boiling point	356·9°C
e) Density	13·546 g/cm^3 at 20°C
f) Vapour pressure	1 mm at 126·2°C
g) Description	Silvery white liquid metal
h) Solubility:	
1) in water	Practically insoluble
2) in organic solvents	Insoluble
3) in acids	Insoluble in dilute hydrochloric or sulphuric acids. Soluble in dilute nitric acid
j) Reactivity	Readily reacts with halogens, sulphur, concentrated hydrochloric acid, concentrated sulphuric acid, hydrogen sulphide, etc

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*Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.

†Glossary of terms relating to air pollution.

4. HAZARDS ASSOCIATED WITH MERCURY

4.1 Health Hazards

4.1.1 *General*

4.1.1.1 Mercury fulminate, an organic compound, is shock sensitive. Alkyl mercury compounds are readily absorbed through skin.

4.1.1.2 Due to the high density of the metal mercury packages are heavy but they are very small in size. While handling such packages, therefore, care is necessary since a slight sudden shift in the centre of gravity may cause a tendency to destabilize the package containing the liquid metal.

4.1.1.3 Mercury gives off vapours even at room temperature. When at equilibrium at room temperature with the source of mercury, the vapour concentrates are 200 times the threshold limit value. The vapour pressure almost doubles for a temperature rise of about 10°C.

4.1.1.4 The principal route of entry of mercury vapour is through the respiratory tract by inhalation. Mercury, in extremely finely divided state, and many of its organic compounds may be absorbed through the skin upon direct contact. If mercury bearing compounds are accidentally ingested, mercury may be absorbed through the alimentary tract. Serious exposure may occur if there is a leak in the mercury boiler or distillation still.

4.1.1.5 Acute local effects may produce irritation, vesication and corrosion of the skin. This may lead to a dermatitis or eczematic rash.

4.1.2 *Acute Toxicity* — The acute toxicity may usually be due to ingestion of large amounts of inorganic mercury compound or from exposure to high dose of organic mercury compound. Acute systemic effects may be due to damage to kidneys. The possible symptoms of exposure may be metallic taste, salivation, burning, swelling, abdominal pain, diarrhoea, ulceration and intestinal haemorrhage. Many symptoms suddenly become acute leading to circulatory damage. In case acute exposure is suspected, immediate medical attention is recommended.

4.1.2.1 *Local effects* — Soluble mercury compounds are irritating to skin and mucous membranes.

4.1.3 *Chronic Toxicity* — Chronic exposure to mercury causes damage to the nervous system. Chronic effects of mercury poisoning include : psychic disturbances, erethism, stomatitis, tremor, salivation, gingivitis. Weakness, fatigue, weight loss are non-specific symptoms. The person with erythema becomes suddenly irritated, excited or depressed. Tremors of extremities is a peculiar sign of mercury exposure. The onset of symptoms of chronic mercury poisoning is insidious. The recovery is usually very slow. It is, therefore, necessary to take preventive measures on all operations involving exposure to mercury.

4.1.4 *Threshold Limit Value (TLV*) in Air* — Recommended threshold limit value (TLV) for mercury is 0·05 mg/m^3 of air for repeated exposure for 8 hours work day and 40 hours work week.

5. STORAGE AND HANDLING

5.1 Storage — Mercury is stored in bottles and containers made of plastics and glass. While it should be stored away from contact with chemicals with which it easily reacts, the containers should be properly closed to reduce formation of vapours. The storage areas should be properly ventilated to avoid a build up of the vapour concentration. The flooring should be of an impervious smooth surface with adequate slope leading to drains via traps at several points and arrangement for washing away any spillage with water. The containers should be plainly labelled.

5.2 Handling — Mercury should be handled in enclosed systems as far as possible. If mercury is to be drained out of equipment such as pumps and meters, it should be immediately covered with a layer of water if permissible, otherwise the receiver should be covered.

5.2.1 Since spillage of mercury is practically unavoidable, the spilled material should be washed away to drains and collected in water sealed traps. Where it is suspected that small tiny droplets of mercury may remain over after adequate washing with water, such flooring/other areas may be sprinkled with lime sulphur spray and swept away after some time as an additional decontamination measure.

5.2.2 It should be explained to the personnel handling mercury that even a small package of mercury is very heavy and should be carefully handled avoiding a sudden shift in its centre of gravity. A sudden shift in the centre of gravity may cause it to fall.

5.2.3 Mercury is transported usually in bottles.

6. PACKING AND LABELLING

6.1 Packing — Mercury may be kept in glass or plastics bottles. The containers must be strong enough to withstand the heavy contents. The closure should be tight fitting to prevent spillage of contents or escape of vapours.

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*As accepted by the American Conference of Governmental Industrial Hygienists, Ohio, USA.

6.2 Labelling — The following information may be incorporated and used in combination with other instructions or separately on the labels:

Mercury Metal Density: 13·5

Heavy liquid metal.

Handle carefully.

Avoid sudden jerks while handling.

Keep away from contact with metals like aluminium, copper, silver, gold, zinc, as it readily forms alloys/amalgams with them.

Avoid spillage.

Spilled material is difficult to retrieve. If spilled, wash down the spillage to the drain with water as soon as possible.

Gives off vapours at all temperatures.

Vapours are toxic on prolonged inhalation.

7. PREVENTIVE MEASURES

7.1 General — Simple protective measures against mercury splash may be used where necessary.

7.1.1 Overalls should have no pockets and cuffs. Hair should be covered with washable cap. Clothes for actual working should be stored separately from street clothes. Eating and smoking should be prohibited in workplaces. Good personal hygiene should be encouraged amongst the employees. Where a respirator has to be used for protection against mercury vapour it must have a suitable filter incorporated.

7.2 Training — Persons engaged in work involving handling of mercury should be instructed on safety measures while handling mercury and steps to be taken to minimize danger from spillage.

7.3 Monitoring — Good ventilation should be provided for dispersal of mercury vapours likely to be given off during normal working. As far as possible, mercury should not be left exposed to atmosphere. Routine monitoring of mercury vapour concentration in the work environment should be undertaken. If at any time, it is observed that the mercury vapour concentration is higher than the recommended threshold limit value, appropriate corrective measures should be taken to bring down the concentration and avoiding unnecessary exposure.

7.3.1 Electrically operated mercury vapour meters are commercially available and are convenient to use. Chemical methods based on use of dithizone, etc, are also available.

7.4 Waste Disposal — Metal mercury being heavy would always accumulate on the bottom. Suitable collection traps should be provided in the drains to collect such mercury. A very small amount of mercury may get dissolved in the effluent water as a result of reaction with the effluent. Effluent should, therefore, be suitably sampled and mercury concentration determined. Necessary steps should be taken to ensure that mercury concentration in the effluent is within the permissible limits before it is discharged to the sewer, etc.

7.5 Pre-employment Medical Examination — In view of the effects of mercury exposure on kidney function, skin and central nervous system, persons showing abnormalities of the above functions as found during a pre-employment examination should be assigned to areas where they will not be exposed to mercury. Persons with poor teeth, infected gums, poor oral hygiene, history of renal disease or with a generally nervous temperament should be preferably excluded.

7.6 Follow-Up Medical Examination — Mercury levels in blood and urine of employees should be determined at suitable intervals and cases showing any deviation from the normal limits should be further investigated. Regular periodic medical examination should be carried out on employees working in areas where mercury exposure is possible. Records of such tests and examination should be properly maintained.

7.6.1 In the periodic medical examination, inspection of mouth for signs of gingivitis, and of hands, and lips for signs of tremors should be included. Urine should be examined for presence of proteins.

(*Continued from page* 2)

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